

CHARACTERIZING THE PERFORMANCE OF THE WHEEL ELECTROSTATIC SPECTROMETER

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A Wheel Electrostatic Spectrometer has been developed as a surveying tool to be incorporated into a Martian rover design. Electrostatic sensors with various protruding cover insulators are embedded into a prototype rover wheel. When these insulators come into contact with a surface, a charge develops on the cover insulator through tribocharging. A charge spectrum is created by analyzing the accumulated charge on each of the dissimilar cover insulators. This charge spectrum can be used to determine differences in Martian regolith properties. In this study, we analyzed the repeatability of the measurements for this sensor package and found that the sensor repeatability lies within one standard deviation of the noise in the signal. In addition, we tested the need for neutralizing the surface charge on the cover insulators and discovered a need to discharge the sensor cover insulators after each revolution. Future work includes an electronics redesign to reduce noise and a Martian pressure static elimination tool that can be used to neutralize the charge on the sensor cover insulators after each wheel revolution.